DOCUMENT RESUME

ED 259 222 CE 042 005

AUTHOR Spencer, Robert E.
TITLE Investigating the Use of the Personalized System of Instruction in Distance Education. REDEAL Research #1. Project REDEAL. Research and Evaluation of Distance Education for the Adult Learner.
INSTITUTION Athabasca Univ., Edmonton (Alberta).
SPONS AGENCY Alberta Dept. of Advanced Education and Manpower, Edmonton.
PUB DATE Oct 80
NOTE 41p.; For related documents, see ED 249 346-348, CE 042 002, and CE 042 004-011.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Persistence; Adult Education; Comparative Analysis; Cost Effectiveness; *Distance Education; Educational Research; Foreign Countries; Higher Education; *Management Systems; *Pacing; *Teaching Methods; *Tutoring; Tutors; Withdrawal (Education)
IDENTIFIERS Alberta; *Personalized System of Instruction

ABSTRACT

A study investigated the effects of using the Personalized System of Instruction (PSI) model in distance education. The PSI version of the course (PSI-P) was compared to a version of the course that was found to be instructionally weak (C), a revised version of the course that had an improved instructional design (IB), and a version of the course that was exactly the same as the PSI-P version, except that feedback to the student was delayed (PSI-M). Students enrolling in Introductory Accounting at Athabasca University from September 1 to November 14 1979, participated. Results indicated that the PSI model (PSI-P) produced higher completion rates than the other three versions. In addition, small differences were found between versions C and IB. Differences between the PSI-M and IB versions were minimal. No differences were found between any of the versions with respect to examination performance. Estimated cost data suggested the PSI-P version is two to three times more expensive to deliver than the other versions. A reason suggested for the higher completion rate of the PSI-P condition was that the PSI model has an instructional as well as a management system for dealing with students. (Seven tables and one figure are attached.) (YLB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED259222

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
✓ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

RESEARCH REPORT SERIES

Investigating the Use of the Personalized System of Instruction in Distance Education

Robert E. Spencer

REDEAL Research Report #1

Project REDEAL

Research and Evaluation of Distance Education for the Adult Learner

BEST COPY AVAILABLE

Athabasca University
14515-122 Avenue, Edmonton, Alberta, Canada T5L 2W4

CE042005

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
D. Coldeway
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Project REDEAL

Investigating the Use of the Personalized System of Instruction in Distance Education

Robert E. Spencer

REDEAL Research Report #1

October, 1980

Sponsored by

Innovative Projects Fund

Advanced Education & Manpower

and

Athabasca University

Athabasca University

14515 122 Avenue

Edmonton, Alberta

Canada T5L 2W4

(403) 452-9990

CE042005

Abstract

The present study investigated the effects of using the PSI model in distance education. The PSI version of the course (PSI-P) was compared to a version of the course which was found to be instructionally weak (C), a revised version of the course which had an improved instructional design (IB), and a version of the course which was exactly the same as the PSI-P version, except feedback to the student was delayed (PSI-M). The results indicated that the PSI model (PSI-P) produced higher completion rates than the other three versions. In addition, small differences were found between version C and version IB. Differences between the PSI-M version and the IB version were minimal. No differences were found between any of the versions with respect to exam performance. Estimated cost data suggest that the PSI-P version is two to three times as expensive to deliver than the other versions. Possible reasons for these differences are discussed and areas for further research are briefly addressed.

Investigating the Use of the Personalized System of Instruction in Distance Education

The Personalized System of Instruction (PSI), as originally outlined by Keller (1968) contains four basic components:

1. Reliance on the written word for instructional purposes.
2. Self-pacing; students work at a rate commensurate with their own abilities and other demands on their time.
3. Mastery; progress through a course is contingent on performing at a specified criterion.
4. The use of tutors to help students progress through a course and provide immediate feedback on their performance.

During the past decade, research has shown that PSI produces higher student achievement and course ratings than more traditional methods of instruction (Kulik, Kulik, and Cohen, 1979). While the majority of the research has been conducted in traditional university settings, recent endeavors have produced similar results in primary and secondary education (Wilson, 1978; Creamer and Dubé, 1978), paraprofessional training (Fawcett, Matthews, Fletcher, Morrow and Stokes, 1976; Petrusa, 1978), and campus based universities with continual enrollment (Toft, 1975).

A natural extension of the use of PSI would be in the area of distance education. This becomes readily apparent when one analyzes the instructional components and delivery modes of distance education courses. Distance education relies heavily on written materials as its instructional medium.

Many distance education courses also allow learners to progress at their own rate; some courses require learners to master materials at a specified level; and some have a built-in tutor network for tutorial and evaluation purposes. However, these components have not often been combined in the same systematic manner as the PSI model would prescribe. Similarly, various other subcomponents inherent in the PSI model have not always been utilized in distance education courses. For example, frequent evaluation, immediate feedback, well-defined behavioral objectives, and the matching of objectives to test items have often been overlooked. Thus, the present study was undertaken to investigate the effects of using the PSI model to design and deliver a distance education course at Athabasca University.

In order to adapt a distance education course to the PSI model, the course must meet certain prerequisite requirements. That is, it must have an "acceptable instructional baseline." The minimum requirements for an "acceptable instructional baseline" are:

1. Well-defined objectives
2. Matching of objectives to self-study exercises and test items
3. Small units of material for which feedback can be obtained.

Introductory Accounting (216), the course selected for the present study, did not have an "acceptable instructional baseline" since the self-study exercises and test items did not always match the instructional objectives. Therefore, the accounting course was redesigned in order to meet this

requirement. Two other changes that modified the existing accounting course were the addition of multiple choice items to the self-study exercises, and the replacement of the multiple choice exams with actual accounting problems. The first modification made it easier to develop a delivery system to provide immediate feedback to students, and the second made the evaluation role of the credit exams more representative of the accounting skills learners should acquire.

Once a course has an "acceptable instructional baseline", one can begin to add on the additional components of the PSI model; e.g., frequent evaluation, immediate feedback, and a mastery criterion. One problem that must be dealt with however, is how to provide the students with immediate feedback. The "standard" way of providing feedback, i.e. through the mail, was not considered acceptable. Several researchers (Graff, Saxe, and Ostlyngen, 1966; and Haggmann, 1970) have reported that the average turn-around time on assignments for distance education institutions using the mail is at least two weeks. Roberson and Crowe (1975) and Daniel and Keating (1978) have suggested that telephone contact can be useful in giving students rapid feedback plus it "humanizes" the learning process. In the study conducted by Roberson and Crowe (1975), they found that an on-campus course using PSI can be delivered just as effectively, if not more so, to students at a distance by using the telephone to provide immediate feedback and personal contact. Thus, the course was redesigned to incorporate the use of the telephone to provide students with immediate feedback.

To test out the effectiveness of the above changes, the present study investigated the effects of upgrading the course to meet an "acceptable instructional baseline", as well as the effects of adding on a frequent evaluation component with a mastery criterion under delayed and immediate feedback conditions.

Method

Subjects and Course Materials

Students (N = 121) enrolling in Introductory Accounting at Athabasca University during the period from September 1 to November 14, 1979 participated in the study. These students enrolled in the course after the course had been modified to meet an "acceptable instructional baseline." Students enrolling during this time were randomly assigned to one of five experimental conditions. In addition, they were randomly assigned to one of three tutors. The tutors in the present study all had "equal" experience in that it was the first time any of them had ever tutored a distance delivered course.

Students who enrolled in the course prior to the modifications served as the control group (C) and were the basis for all experimental comparisons. The students (N = 95) serving as the control enrolled in the course from August 15 to November 14, 1978. Students who enrolled in the equivalent course at North Island Collge, a sister institution,

were not included in the control group (C) nor were they randomly assigned to any of the experimental conditions.

General University Policy

At the time of enrollment, all students who enroll in a distance delivered course at Athabasca University are assigned a course tutor. Students have toll-free phone access to their tutors on a weekly basis, approximately six hours per week. Students are allowed to progress through a course at their own rate, self-pacing, with the restriction that the entire course must be completed within a certain time frame. Since Introductory Accounting is a six-credit course, students were allowed up to twelve months to complete the course. Exceptions to the twelve-month completion requirement may be granted through an extension or suspension. Extensions for completing the course may be obtained by writing the Registrar prior to the end of the twelve months, at a cost of $10 per month until completion. A suspension, or postponement of study up to six months, is obtained by writing the tutor. Only one suspension per course is allowed.

Experimental Conditions

The five experimental conditions evaluated in the present study were: 1) Instructional Baseline (IB); 2) PSI-Phone (PSI-P); 3) PSI-Mail (PSI-M); 4) Choice between conditions 1 and 2 (Choice 1); and 5) Choice between conditions 1 and 3 (Choice 2). The number of

students assigned to each group by tutor is presented in Table 1. The number in parenthesis are the number of students who cancelled their enrollment within 60 days. For the purpose of this study, data from these students will not be included in any of the analyses.

Table 1 goes about here

The five experimental conditions are described below.

Instructional Baseline (IB)

Students in the instructional baseline condition (IB) were instructed to read each assigned chapter in the course text in conjunction with the study guide. They were also instructed to answer the questions and solve the problems and exercises at the end of each chapter in the text and answer a ten-question multiple-choice quiz. The students evaluated their own performance on the multiple-choice quizzes by checking their answers with the answers provided in the course materials. The students were advised to take form two of a quiz if they missed more than two of the ten questions. Student progress through the course and course marks were not dependent on how the student performed on the multiple-choice quizzes. That is, there was not a mastery criterion established for the multiple-choice quizzes and a student's grade was based on the average of the six credit exams given in the course. A mark of 60% or better was required

to pass each credit exam. Students receiving less than 60% were required to write a supplemental exam. Students had access to their tutors by phone during regular tutor hours to discuss course-related problems.

PSI-Phone (PSI-P)

Students in the PSI-Phone (PSI-P) condition received the same instructions as students in the IB condition except they were instructed to phone their tutor once they completed a multiple-choice quiz. Students in this condition were not given the answers to the quizzes with their course materials; so, they were required to phone in their answers to each quiz. The tutors graded each quiz over the phone and provided the student with immediate feedback. If the student missed more than two of the ten questions, he/she was required to take form two of the quiz and phone in the answers at a later time before being allowed to progress to the next unit in the course. Thus, an eighty percent mastery condition was in effect. If a student did not receive a score of eight or better on the second form, the higher of the two marks counted and the student was advised to restudy the material before proceedin in the course. Approximately 40% of the marks possible in a credit were from the multiple-choice quizzes. The remaining 60% could be earned on the credit exam. In order to pass a credit exam, however, students still had

to score 60% or greater on the exam. Course grades were determined by averaging the marks earned on all six credits. In addition to phoning a tutor to get a quiz evaluated, students could also phone their tutor any time during the regular tutor hours to discuss course-related problems.

PSI-Mail (PSI-M)

Students in the PSI-Mail (PSI-M) condition followed the same procedures as students in the PSI-P condition, with one exception. Students in this group mailed in their answers to their tutor instead of phoning them in. Once the tutor received and marked the quiz, the tutor phoned the student to give him/her feedback and to inform him/her of the results. The same 80% mastery condition was in effect and course grades were determined in the same manner as in the PSI-P condition. In addition, students could call their tutor any time during the regular tutor hours to discuss course-related issues. Thus, the only difference between the two conditions was the length of time students had to wait to receive feedback on their quizzes. The PSI-P condition provided immediate feedback; whereas the PSI-M condition provided delayed feedback.

Choice Between IB and PSI-P (Choice 1)

In order to obtain a measure of student preference, students in the Choice 1 condition were given the option of taking the IB version of the course or the PSI-P version. At the time of enrollment, students were sent a letter explaining the differences between the two conditions and were asked to call the author and indicate their preference. The author then notified the student materials section of the University as to which version of the course to send the student.

Choice Between IB and PSI-M (Choice 2)

The same procedures were followed in the Choice 2 condition as in the Choice 1 condition. The only difference was that students had to choose between IB and PSI-M.

Dependent Measures

The dependent variables analyzed in the present study were exam performance, rate of progress, completion rates, type, number, and length of telephone interactions, student choice data, and cost data. Data was collected on all the above measures for all experimental conditions. Whenever possible, the same measures were collected for the control group (C). In order to obtain accurate information concerning the type, number, and length of telephone interactions, a special form was developed for the tutors (see Appendix A). Prior to the beginning of the study, the tutors were trained by the author as to its use and the definitions of the different categories of interaction. A list of the definitions is presented in Appendix B.

Results

The results presented in this paper are only preliminary in that the students had only been enrolled in the course for a period of eight to ten months. While the data were analyzed for each tutor, to simplify the presentation of the results, the data were collapsed across tutors for each experimental condition. Collapsing data in this manner seems justified since students were randomly assigned to both a tutor and an experimental condition and in addition, the trend of the data for each of the experimental conditions appeared to be consistant between tutors.

Choice Data

When students were given the choice between taking the course under the IB condition or the PSI-P condition (Choice 1), 11 out of the 12 (91.7%) initially chose the PSI-P condition. However, one student asked to switch to the IB condition shortly after beginning the course. The reason the student gave for requesting the change was that she had experienced difficulty getting in touch with the tutor and she did not want this problem to impede her progress. Thus, 10 of the 12 students (83.3%) ended up choosing the PSI-P condition. Another student, although he selected the PSI-P condition, took the course under the IB condition since he was sent the wrong course materials. Results of the Choice 2 condition showed that 11 out of the 11 students (100%) chose the PSI-M condition rather than the IB condition.

Since the purpose of the Choice 1 and Choice 2 conditions was to find out which condition students prefer to learn under and since the size of

groups were quite small, the dependent measures collected for the present study were not analyzed separately. Instead, these data were combined with the other three experimental conditions. That is, if a student chose to take the course under the PSI-P condition, for example, then data from that student was combined with data from students assigned to the PSI-P condition etc. Table 2 presents the number of students in each of the three experimental conditions after the students in the Choice 1 and Choice 2 conditions were included.

Table 2 goes about here

Rate of Progress

Figure 1 shows the percentage of students who passed each credit exam for each of the three experimental conditions, as well as for the control group. It should be pointed out again that these percentages represent credit exams passed after the students had been in the course for eight to ten months.

Figure 1 goes about here

In general the results can be summarized as follows: 1) a substantially larger percentage of students in the PSI-P condition, than in any of the other conditions, passed the first three credit exams, 2) the percentage of students in the control group passing the first three exams was lower than any of the three experimental groups, 3) with the exception of credit exam 1, the PSI-M and IB condition appear to be relatively equal with regards to the percentage of students passing exams, and; 4) the difference between the groups for the last three credit exams is minimal. Another interesting finding is the dramatic drop in the number of exams passed from credit to credit. The drop between credit one and credit two ranges from 20 to 22 percent. The drop between credit two and credit three ranges from 6 to 13 percent.

Exam Performance

The mean scores for the first attempt of each of the six credit exams for each group is presented in Table 3. The numbers in parenthesis indicate the number of students taking each exam. The results show that the mean scores were not substantially different for the four groups on

---

Table 3 goes about here

---

the first three credit exams. The exceptions were found in the IB condition. Students in the IB condition scored 14 to 16 percent lower on the average on the first credit exam than the other groups; but, they scored 8 to 10 percent higher on the third exam than the other four groups. Results from the last three credit exams show much larger

differences between groups, however, only a small number of students took these exams. Thus, the results are only preliminary and are subject to change as more students complete the credit exams.

Completion/Attrition Rates

At the time of analysis, eight to ten months after the students had begun their studies, very few students had completed the course. Therefore, a procedure was developed to predict completion rates so comparisons could be made between groups. The procedure used determined whether a student's progress in the course was "on target" or "behind target" for completing the course. Students who had been enrolled in the course for eight months were considered to be "on target" if they had passed the first three credit exams. Students who had been enrolled in the course for nine or ten months were considered to be "on target" if they had passed the first four credit exams. Conversely, students who did not meet the above criteria were considered to be "behind target". The criteria were based on giving the students three months to pass the first exam and two months to pass each subsequent exam. The theory behind this prediction procedure is that if students are "on target" then they will complete the course; students "behind target" will not complete the course. Thus, completion rates for the three experimental groups would equal the percentage of students "on target" plus the percentage of students who had already completed the course.

Completion rates for the three experimental conditions are as follows:

11% for the IB condition, 26% for the PSI-P condition, and 13% for the PSI-M condition. These percentages are based on the total number of students in each condition who enrolled in the course. Another way to calculate completion rates would be to eliminate students who never started the course, non-starters, before making the calculations. A non-starter, however, can be defined in several ways. Students could be considered non-starters if they never began their studies, if they never completed any assignments, or they never wrote an exam. Table 4 shows the number and percentages of students who: 1) never had any contact with their tutor nor did anything in the course (NC); 2) never submitted any assignments or indicated to their tutor that they had not begun their studies (NS); 3) never wrote an exam (NE); 4) were "behind target" (BT); 5) were "on target" (OT); 6) withdrew from the course (W), and; 7) completed the course (C).

Table 4 goes about here

If one eliminates the number of students who fall into the NC and NS categories before calculating completion rates, then the percentage of students completing the course would be 14%, 27%, and 16% for the IB, PSI-P, and PSI-M conditions respectively. If one eliminates the NC, NS, and NE categories then the completion rates would be 24%, 33%, and 21% for the IB, PSI-P, and PSI-M conditions respectively. Table 5 shows the formulas and various calculations which were done to determine the above completion rates.

Table 5 goes about here

Since detail data was not obtainable for the control group (C), completion rates could not be calculated in the same manner as they were for the three experimental groups. Thus, only completion rates based on total enrollments were calculated. The results show that 9% of the students in the control group completed the course, 86% withdrew, and 5% were still enrolled in the course, 16 to 18 months after they enrolled.

The final measure used to express completion rates is the average number of credit exams written by each group. This was calculated by dividing the total number of students in each group into the total number of exams written by each group. The results show that the control group (C) completed an average of .87 exams; students in the IB condition wrote an average of 1.17 exams; students in the PSI-P condition wrote an average of 1.82 exams, and students in the PSI-M condition wrote an average of 1.03 exams.

Telephone Interactions

An analysis of the tutor telephone logs reveals that the average number of phone calls per month between tutor and student is .5, 1.5, and .98 for the IB, PSI-P, and PSI-M conditions, respectively. Approximately 69% of the phone calls were tutor-initiated for the IB condition as compared to 31% for the PSI-P condition and 74% for the PSI-M condition. For all three experimental groups, student-initiated calls lasted between two to three times longer, on the average, than tutor initiated calls. Tutors were unsuccessful in contacting the students in the IB condition 88 times, as compared to 64 times for the PSI-P students and 104 times for the PSI-M

students. When contact was made, either tutor or student-initiated, 37% of the conversations dealt with course-content related issues (CC) in the IB condition, as compared to 76% in the PSI-P condition and 69% in the PSI-M condition. Another major difference found was that 71% of the phone contacts in the IB condition were made for the purpose of checking-in (CI) with the students or tutor. This compares to 24% and 47% for the PSI-P and PSI-M conditions, respectively. When one calculates the number of months in which there was no contact between tutor and student and the tutor did not attempt to reach the student by phone, the results show that the tutors did not attempt to contact students in the IB condition for half the months in which they were enrolled. There was no contact or attempted contact for 30% of the months students in the PSI-P condition were enrolled and 48% of the months students in the PSI-M condition were enrolled. The average amount of time spent on the phone for the months in which there was contact was 5.31 minutes, 16.53 minutes, and 8.67 minutes for the IB, PSI-P, and PSI-M conditions, respectively. Thus, students in the PSI-P condition spent approximately two to three times longer on the phone than did students in the IB and PSI-M conditions. A summary of the above results is presented in Table 6.

Table 6 goes about here

Due to a lack of data, similar analyses could not be conducted for

the students in the control group (C). One can, thus, only assume that the results would have been quite similar to the results found for students in the IB condition.

Cost Analysis

Table 7 presents the costs per month related to long-distance phone calls for the three tutors in the experimental groups. Efforts were not

---

Table 7 goes about here

---

made to determine the costs related to each experimental condition. However, one can estimate these costs by referring back to Table 5. Since the average number of minutes spent on the phone per contact month was 5.31, 16.53, and 8.67 minutes for the IB, PSI-P, and PSI-M conditions respectively, one can assume that the PSI-P condition was approximately three times as expensive as the IB condition and twice as expensive as the PSI-M condition.

Discussion

The results of the present study seem to indicate that the PSI model can be successfully implemented in distance education by using the telephone as the means of providing students with immediate feedback. Based on predicted completion rates calculated by using the total enrollment formula (formula 1), the PSI-P condition resulted in three times as many

completions than the control group (C), more than twice as many completions than the IB condition, and twice as many completions as the PSI-M condition. The differences in predicted completion rates, however, are somewhat less when one calculates completion rates using the different non-start completion formulas (formula 2 and 3). The reason for the smaller differences is that the PSI-P condition was more effective in dealing with the non-start problem. This phenomenon becomes quite apparent when one looks at the large differences in the percentage of students completing the first credit exam. In addition to increasing the number of first credit exams taken, the PSI-P condition also responsible for a larger number of students completing subsequent exams, e.g. credits two and three. Not only did more students in the PSI-P condition pass the third credit exam but a larger percentage of these students passed the exam "on target" which accounts for the differences in predicted completion rates reported herein. The only dependent variable the PSI-P condition did not appear to effect was exam performance. It is quite possible, however, that the three experimental conditions did produce better exam performance, but since the control group took different exams it was impossible to make adequate comparisons.

The reasons why the PSI-P condition produced "superior" results could be many. However, it is the author's opinion that the reason why the PSI-P condition was found to result in higher completion rates etc. is that the PSI model has an instructional, as well as, management system for dealing with students. The latter appears to be quite important for adult learners in distance education. This opinion seems to be supported when one looks at the differences found between conditions

which all used the same instructional materials, but had different built-in delivery/management systems. The IB condition relied on self-evaluation; the PSI-P condition had frequent evaluation, immediate feedback, and a mastery criterion; the PSI-M condition included frequent evaluation, delayed feedback, and a mastery criterion. The relatively small differences found between the control group and IB condition also suggest that a "sound" instructional package is not enough to substantially effect completion rates. That is to say, it does not appear that bringing a course up to an "acceptable instructional baseline" is enough to dramatically effect completion rates. What is needed it seems is a system that supports the instructional package and manages the student's activities on an on-going basis. Data from the two choice conditions indicates that students also see this need.

One might conclude from the results of the present study that the differences found between the PSI-P condition and the other two experimental conditions, IB and PSI-M, were the result of immediate feedback. While the importance of immediate feedback should not be underestimated, it is quite possible that the delivery/management system which is necessary to provide students with immediate feedback was actually what caused the differential completion rates, etc. The analysis of the data from the tutor telephone logs appears to support this notion. The responsibility of making contact with the tutor was placed in the student's hands in the PSI-P condition. Whereas, in the other conditions it was the tutor's responsibility to make sure that

contact with their students was maintained. This accounts for the dramatic differences found in the number of tutor-initiated phone calls between the PSI-P condition and the other conditions. Requiring the students to call their tutor also ensures that a reasonable number of contacts per month between tutor and student are made and fewer months go by without tutor-to-student contact. In addition, by establishing a purpose for the phone calls, receiving feedback on assignments, the interaction between student and tutor becomes more functional. That is, a greater majority of the conversations deal with content-related issues as opposed to merely checking-in on the student's progress.

Given the findings of the present study, one must address the question of whether or not the improved completion rate of the PSI-P condition is worth the additional cost associated with the long-distance phone bills. While the present study did not analyze the exact costs of providing students immediate feedback over the phone, it was estimated that the cost would be approximately three times greater than the cost of deliverying the same course via the IB condition. This is a very important decision that distance education institutions must face. Given the costs associated with developing instructional packages for distance delivery, however, this cost seems relatively small.

In summary, it does not appear that merely improving the instructional package of a distance education course will improve completion

rates. The results suggest that the instructional design of a course must also incorporate systems that integrate the instructional components of a course with an effective delivery/management system. The results of the present study suggest that the PSI model provides the needed integration.

Since the generalization of the finding of the present study are quite limited, the author suggests that further studies should be carried out to test the effectiveness of the PSI model in other distance education courses. Some courses might prove to be more difficult to adapt to a PSI model and other methods might have to be developed to provide immediate feedback to students. In addition, methods to improve the existing model should be investigated. Strategies need to be developed that will increase the number of students completing a larger proportion of their studies.

References

Creamer, R.C. and Dubé, N.S. Administration of personalized instruction programs in the middle school. In J.G. Sherman, R.S. Ruskin, and R.M. Lazar (Eds.), Personalized Instruction in Education Today: Selected Papers from the Third and Fourth National Conferences on Personalized Instruction. San Francisco: San Francisco Press, 1978.

Daniel, J.S. and Keating, C. The Telephone in Teaching and Learning: A Guide to Canadian Educators. Transcanada Telephone System, 1978.

Fawcett, S.B., Matthews, M.R., Fletcher, R.K., Morrow, R., and Stokes, T.F. Personalized instruction in the community: Teaching helping skills to low-income neighborhood residents. Journal of Personalized Instruction, 1976, 2, 86-90.

Graff, K., Saxe, B., and Osthyngen, E. Correspondence education in Europe today. CEC Yearbook, 1966, 42-77.

Haagmann, H.G. Zur Didaktik des Fernunterrichts. Stuttgart: Klett, 1970.

Keller, F.S. "Good-bye teacher..." Journal of Applied Behavior Analysis, 1968, 1, 78-89.

Kulik, J.A., Kulik, C.C., and Cohen, P.A. A meta-analysis of outcome studies of Keller's personalized system of instruction. American Psychologist, 1979, 34, 307-318.

Roberston, J.A. and Crowe, C.T. PSI + TEL = New horizons in continuing education. Paper presented at the Annual Conference of the American Society for Engineering Education. Fort Collins, Colorado, 1975.

Toft, R. College IV: A new approach. In J.M. Johnston (Ed.), Research and Technology in College and University Teaching. Gainesville, Florida: Department of Psychology, University of Florida, 1975.

Petrusa, E.R. Ophthalmoscopy: A self-paced unit for physician assistants. In J.G. Sherman, R.S. Ruskin, and R.M. Lazar (Eds.), Personalized Instruction in Education Today: Selected Papers from the Third and Fourth National Conferences on Personalized Instruction, San Francisco: San Francisco Press, 1978.

Wilson, J.A. Johnny gets personalized. In J.G. Sherman, R.S. Ruskin, and R.M. Lazar (Eds.), Personalized Instruction in Education Today: Selected Papers from the Third and Fourth National Conferences on Personalized Instruction, San Francisco: San Francisco Press, 1978.

Table 1

Assignment of Students by Condition and Tutor

	IB	PSI-P	PSI-M	Choice 1	Choice 2
Tutor 1:	11 (1)	10	10 (1)	4	4
Tutor 2:	12	9 (2)	9	4	3 (1)
Tutor 3:	10 (3)	10	9 (1)	4	4

Table 2

Number of Students in Each Condition by Tutor After Choices Were Made

Tutor	IB	PSI-P	PSI-M
1	13	12	14
2	13	12	11
3	10	14	13
Totals	36	38	38

Table 3

Mean Exam Scores by Credit for First Attempt

Condition	Exam 1	Exam 2	Exam 3	Exam 4	Exam 5	Exam 6
Control	83.6 (N=38)	83.3 (N=19)	77.7 (N=11)	77.9 (N=8)	76.8 (N=4)	79.1 (N=3)
IB	69.5 (N=16)	81.2 (N=11)	85.1 (N=8)	55.4 (N=5)	70.0 (N=4)	61.0 (N=2)
PSI-P	83.3 (N-30)	81.4 (N=18)	75.6 (N=14)	58.0 (N=6)	80.0 (N=2)	67.0 (N=2)
PSI-M	85.2 (N=20)	85.3 (N=9)	76.4 (N=7)	81.0 (N=2)	93.0 (N=1)	--

Table 4

Course Status of Students in the Three Experimental Conditions

	Course Status						
Condition	NC	NS	NE	BT	OT	W	C
IB (N=36)	6 (17%)	1 (3%)	12 (33%)	12 (33%)	2 (5.5%)	1 (3%)	2 (5.5%)
PSI-P (N=38)	1 (2.5%)	0 (0%)	7 (19%)	19 (50%)	8 (21%)	1 (2.5%)	2 (5%)
PSI-M (N=38)	3 (8%)	3 (8%)	8 (21%)	15 (39%)	5 (13%)	4 (11%)	0 (0%)

Table 5

Formulas Used and Calculations Done to Determine Completion Rates

Formulas

Formula 1:

$$\frac{\text{number of students "on target" + number of students completing}}{\text{total enrollments}} \times 100$$

Formula 2:

$$\frac{\text{number of students "on target" + number of students completing}}{\text{total enrollments - (NC + NS)}} \times 100$$

Formula 3:

$$\frac{\text{number of students "on target' + number of students completing}}{\text{total enrollments - (NC + NS + NE)}} \times 100$$

Calculations

IB (Formula 1): $\frac{2 + 2}{36} = \frac{4}{36} = 11$

PSI-P (Formula 1): $\frac{8 + 2}{38} = \frac{10}{38} = 26$

PSI-M (Formula 1): $\frac{5 + 0}{38} = \frac{5}{38} = 13$

IB (Formula 2): $\frac{2 + 2}{36 - (6+1)} = \frac{4}{29} = 14$

PSI-P (Formula 2): $\frac{8 + 2}{38 - (1+0)} = \frac{10}{37} = 27$

PSI-M (Formula 2): $\frac{5 + 0}{38 - (3+3)} = \frac{5}{32} = 16$

IB (Formula 3): $\frac{2 + 2}{36 - (6+1+12)} = \frac{4}{17} = 24$

PSI-P (Formula 3): $\frac{8 + 2}{38 - (1+0+7)} = \frac{10}{30} = 33$

PSI-M (Formula 3): $\frac{5 + 0}{38 - (3+3+8)} = \frac{5}{24} =$ [illegible]

Table 6

Summary of Major Findings Based on an Analysis of Telephone Logs

	Condition	
IB	PSI-P	PSI-M
.5 contacts/month	1.5 contacts/month	.88 contacts/month
69% of contacts tutor-initiated	31% of contacts tutor-initiated	74% of contacts tutor-initiated
88 tutor calls no answer	64 tutor calls no answer	104 tutor calls no answer
37% of calls content-related	76% of calls content-related	69% of calls content-related
71% of calls for checking in	24% of calls for checking in	47% of calls for checking in
50% of months no attempt at contacting student	30% of months no attempt at contacting student	48% of months no attempt at contacting student
5.31 minutes contact/month	16.53 minutes contact/month	8.67 minutes contact/month

Table 7

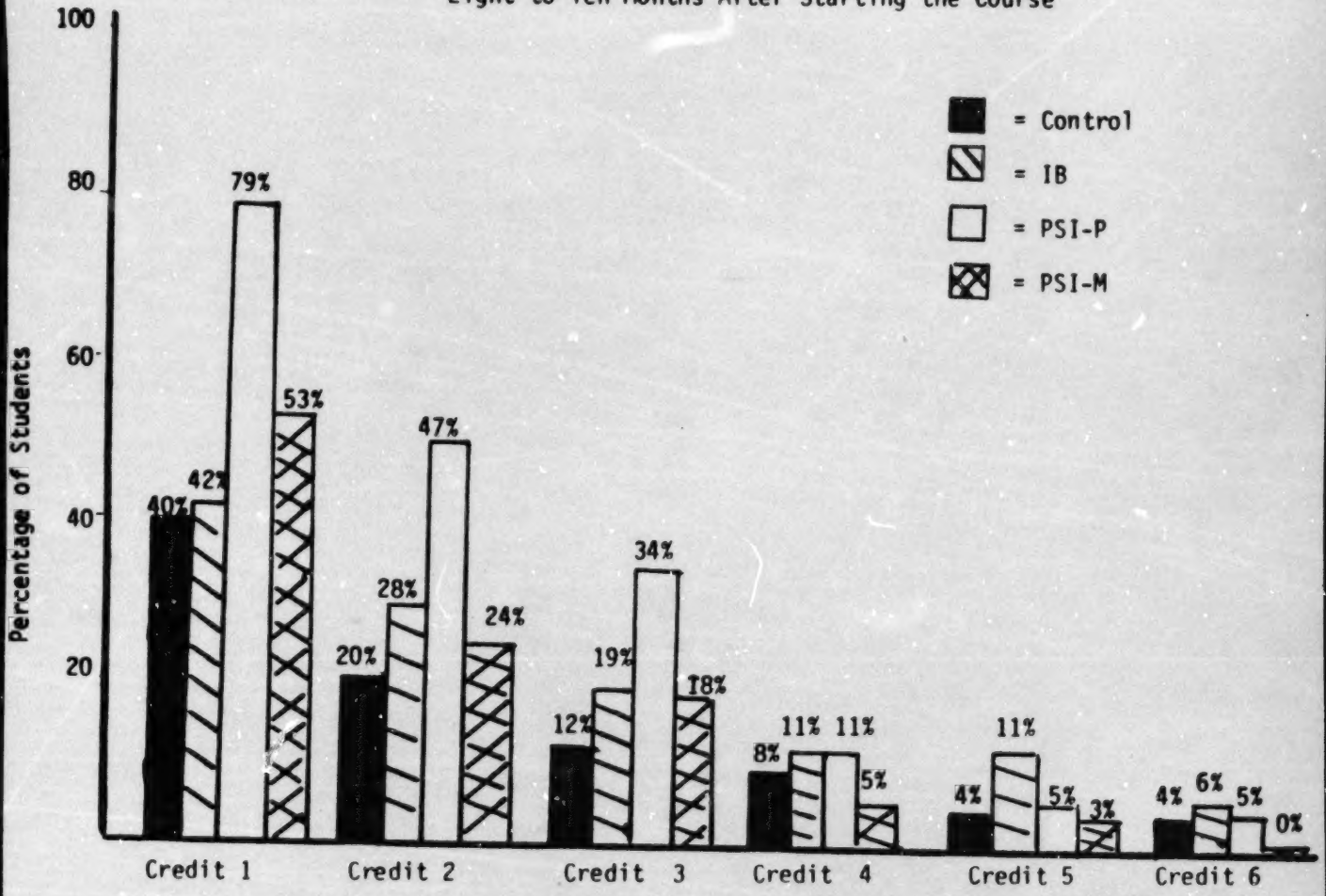
Cost Related to Long-Distance Phone Calls

	Tutor 1	Tutor 2	Tutor 3
October, 1979	$ 91.73	$ 149.83	$ 138.73
November, 1979	84.86	248.87	224.64
December, 1979	96.05	107.01	60.57
January, 1980	239.79	200.51	52.85
February, 1980	81.01	198.67	176.42
March, 1980	258.32	233.11	160.19
April, 1980	243.04	98.65	102.51
May, 1980	209.42	no data	45.40
June, 1980	207.63	no data	48.49
July, 1980	187.76	77.20	65.89
Totals	$1699.61	$1313.85	$1075.69

Figure 1

Percentage of Students Passing Each Credit Exam

Eight to Ten Months After Starting the Course



Appendix A

Athabasca University

TUTOR ACTIVITY LOG

Student _____ Tutor _____ Month _____ Group _____

Date	Telephone Contacts											Quiz Information					
	T-I*	S-I*	Length	Type of Call							Chap	Form	Date received/ marked	Mark	Item number(s) missed	Comments
				CI	CC	A	H	O	E	NA						

* T-I = Tutor initiated
* S-I = Student initiated

CI = checking in
CC = course related content issues
A = administrative details

H = help related to studying, life goals, personal problems
O = quiz marking/feedback
E = exam feedback

NA = no answer

1910

BEST COPY AVAILABLE

PSI

35

Appendix B

Category Abbreviations	Explanation
CI	Checking In. This would normally be a call by the tutor to see how the student is doing, whether the student is having any difficulties, or if the student has questions. It might involve simply asking the student if he/she is still working in the course, when he/she plans on completing the next assignment. A student could, however, initiate this type of call. For example, a student could call the tutor and let the tutor know how she/he is progressing in the course, that he/she just received the course materials and tutor letter, etc.
CC	Course-related content issues. Both the student and the tutor could initiate this type of call. Conversations about the course content are covered by this category. That is, the nature of the conversation is about what is being taught in the course (e.g. "How do I finish problems 3 - 22 on page 71?" "I'm having problems with the concept of amortization, would you please explain it to me?").

A Administrative details. Both the student and the tutor could initiate this type of call. A conversation of this nature would involve questions such as where to send an examination request, how to get a course extension, how many assignments can one get mailed at any one given time, when are you available for tutoring, what is the transferability of this course to the U of A, etc.

H Help related to studying, life goals, personal problems. This normally would be a call by the student. However, a tutor could bring up the topic or return a call in order to answer the student's concerns. The nature of this call would be such things as: "What is the best way for me to manage my time for studying for the exam? Will this course really help me to get what I want out of a post-secondary education?" Notice that advising or counselling probably best sums up the nature of this discourse. Related to personal problems, one example might be: "How have other learners at Athabasca University who have families managed to get seclusion to work on their course? I am having trouble with family interruptions all the time."

Q — Quiz feedback/marking. This type of call could be initiated by either the student or tutor. The nature of the call deals with getting a quiz marked, and/or receiving feedback on the quiz. If course-related content issues are discussed in the process both categories should be checked off.

E — Exam feedback. This type of call could be initiated by either the student or the tutor. The student could call the tutor to see if he/she had received the exam mark. The tutor could call the student to give the student feedback on the exam. If in the process of giving the student feedback, the tutor discusses course related content issues both categories should be checked off.

NA — No Answer. The category to be checked off any time the tutor is unsuccessful in getting in touch with the student.

PLEASE NOTE: Any one phone call may involve several categories. Therefore, you may be checking two or more categories for each phone call placed or received.